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AUTHOR Porter, Eleanor; And Others
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ABSTRACT

A United States Employment Service (USES) General Aptitude Test Battery (GATB) plan was formulated to evaluate and develop additional job-related assessment methods. Eighteen alternative predictors were reviewed, from which biodata was selected for development. The literature indicates that biodata provides increased validity with little or no adverse impact. The focus will be on writing that will generalize across an occupational cluster and on the identification of relevant constructs. Items will inquire about background information and life experiences and will be screened for bias. Various scoring methods will be reviewed and evaluated as research progresses. The plan includes administration of the experimental biodata instrument along with the GATB. Future results will demonstrate whether biodata, with or without the GATB, improves validity and reduces adverse impact. Five tables summarize testing plans. (Author/SLD)

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Development Of A Biographical Data Instrument

Eleanor Porter, Lawrence Lipson,

Olivia Butler, and Moisés V. Andrade

Northern Test Development Field Center

U.S. Department of Labor

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Abstract

A USES GATB Research Plan was formulated to evaluate and develop additional job related assessment methods. Eighteen alternative predictors were reviewed, of which, biodata was selected for development. The literature indicates biodata provides increased validity with little or no adverse impact. The focus will be on item writing that will generalize across an occupational cluster and on the identification of relevant constructs. Items will inquire about background information and life experiences and will be screened for bias. Various scoring methods will be reviewed and evaluated as research progresses. The plan includes administration of the experimental biodata instrument along with the GATB. Future results will demonstrate whether biodata, with or without the GATB, improves validity and reduces adverse impact.

The U.S. Employment Service

The Wagner-Peyser Act of 1933 established the U.S. Employment Service (USES) as a federal-state program that helps employers find workers and job seekers find work.[1]

Test Research by U.S. Employment Service

The U.S. Department of Labor (USDOL), through the USES, in cooperation with State Employment Security Agencies (SESAs) has conducted occupational test research since the 1930s. Presently, there are four Test Development Field Centers (TDFCs) with corresponding Test Research Units (TRUs). These are listed in Table 1.

Insert Table 1 about here.

This test research program has produced a variety of assessment instruments (see Table 2).

Insert Table 2 about here.

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[1]The National Academy of Sciences report, Fairness in Employment Testing (1989), provides a detailed history to the U.S. Employment Service and the General Aptitude Test Battery.

The General Aptitude Test Battery (GATB) is widely used for vocational counseling and selection for specific jobs.

History of GATB

Since its publication in 1947, the GATB has been researched in a continuing program of development and occupational validation. It is a speeded test that measures nine aptitudes with 12 subtests.

Research has produced over 450 Specific Aptitude Test Batteries (SATBs), consisting of combinations of two, three, or four aptitudes for specific occupations. Beginning in 1972, emphasis was given to revalidating existing SATBs using samples which include subgroups of minorities large enough to permit separate statistical analysis. This revalidation effort took place because the SATBs might have adverse impact on minority groups.

Validity Generalization

In 1980, USDOL contracted Dr. John Hunter of Michigan State University to conduct validity generalization (VG) studies on the GATB database. As a result, the USES implemented an experimental test-based referral system called the VG-GATB Referral System which made referrals on a top-down percentile basis.

Given that minority groups generally do not perform as well as the majority group on the GATB, referral based on top-down percentiles adversely affected the employment chances of minorities.

To counteract this effect, decided to convert aptitude scores into within-group percentile ranks. The resulting percentile scores reflected an applicant's standing with reference to his or her own racial or ethnic group.

Justice Department Challenge

In November of 1986, The U.S. Department of Justice challenged within-group scoring as reverse discrimination. The difference between the Labor and Justice Departments' opinions was the legality of extending race-conscious preferential treatment as a means of combating discrimination. Neither department disputed that there is a powerful legacy of discrimination to overcome.

The Justice Department's challenge to within-group scoring was decided by the Civil Rights Act of 1991 which addresses the issue directly: "It shall be an unlawful employment practice...to adjust the scores of, use different cutoff scores for, or otherwise alter

the results of, employment related tests on the basis of race, color, religion, sex, or national origin."

However, DOL thought that within-group scoring was an extension of a referral policy negotiated in 1972 among the Department of Labor, the Equal Employment Opportunity Commission, and the Department of Justice to avoid discrimination against minorities and to protect equal employment opportunity.

Labor and Justice agreed not to halt use of the VG-GATB Referral System until a thorough study of it could be conducted by a body of experts. Thus, the National Academy of Sciences (NAS) was commissioned to review the GATB.

The resulting NAS report (1989), Fairness in Employment Testing: Validity Generalization, Minority Issues, and the General Aptitude Test Battery, made various recommendations. Based on one of these recommendations, a proposed USES-GATB research plan was formulated and published in the Federal Register, vol. 55, No. 142 (July 24, 1990) stating "A more promising approach [of reducing score differences] appears to be developing and evaluating additional job related assessment methods such as biographical information."

Biodata Research Project

In 1990, The Northern Test Development Field Center (NTDFC) in Detroit, Michigan, along with staff from the New York and Massachusetts TRUs, began a comprehensive literature review on alternative predictors to the GATB. This led to an examination of 18 alternate predictors.

After a review, biodata (the use of biographical information to predict future performance) was selected because it appears to provide increased validity with little or no adverse impact. Subsequently, the clerical cluster of occupations was identified for development of the biodata instrument.

Development of a biodata instrument does not mean the abandonment of the GATB. To the contrary, the GATB will be administered along with the experimental biodata instrument. The final instrument may be a combination of biodata and all, or parts, of the GATB, depending on which combination yields the best prediction and the least adverse impact.

Generalizability

Subsequent literature review during 1991 provided evidence for generalizability. For example, Rothstein

et al. (1990) said, "Biodata instruments can be constructed and validated in a way that will lead to validity generalizability." (p. 182).

According to the literature, to achieve generalizability across locations and within occupational groupings, the following steps are needed: (a) identify broad measures and abilities that would apply across occupations (Sharf, 1991), (b) validate and cross-validate large samples (Brown, 1978), (c) identify and define broad criterion and reference groups (Mumford & Owens, 1987), (d) conduct thorough job analysis (Mumford & Owens, 1987), (e) consider the age range and likely antecedent behavior and experiences of the target population (Mumford & Owens, 1987), (f) conduct cross-organizational keying (Rothstein et al., 1990), (g) screen item content for the range of jobs to be covered (Gandy et al., 1989), and (h) develop job-generic criteria (Gandy et al., 1989).

Based on the literature review, the NTDFC made the following recommendations for the development of a biodata instrument.

To begin, attention should focus on one or more

large, relatively homogeneous grouping(s) of occupations, such as clerical or health care. These groupings should be those that: (a) the Job Service handles now or is expected to handle in the future and/or (b) are among the projected "demand" occupations.

Next, an analysis of the major duties and abilities common to each grouping should be undertaken. Finally, separate forms and/or scoring keys may need to be developed for different occupational groups.

Biodata Instrument Development Plan

A biodata development plan was originally written in August, 1991. Since then, the plan has undergone three revisions. The latest plan (see Table 3), targets November, 1994 as the completion date.

Insert Table 3 about here

The completed biodata instrument will include at least two alternate forms and a report on development and analysis. There are nine steps in the plan. Some of the steps overlap and will be conducted concurrently. The dates on the plan are the expected

completion dates for each step

Steps 1 and 2, Development of Research Plan, and Interview and Report of Experts Contacted, are completed. In step 2, the biodata team contacted and interviewed 19 experts in biodata instrument development. In December, 1991, a report summarizing the results of all the interviews, including recommendations for an advisory panel, was submitted to the national test development office in Washington, DC. Step 3, Advisory Panel Selection is still pending.

Step 4, Item Writing Training has been completed. Step 5, for the job analysis, a cluster of clerical occupations has been targeted. A nationwide effort of data collection will be implemented and completed by April, 1993.

Step 6, Criteria Development, is still pending. Multiple criteria are expected to be utilized. A global supervisory rating scale, similar to the scale used in GATB validity studies, is expected to be used as one of the criteria. Other measures under consideration are tenure, absenteeism, and salary increases. Objectives for selecting criteria include the following cited by van Rijn (1992): must be valid,

reliable, fair, unbiased, realistic, relevant, understandable, inexpensive, and acceptable to management.

Steps 7 and 8 include the data collection for and analysis of the pilot and experimental instruments. Finally, in step 9, a report of the results and administration manuals will be completed by August, 1994.

Construct Development

From the literature review and contacts with experts, the NTDFC identified 75 potential constructs that could be used for a biodata instrument. A definition of the term, construct, adapted from Klimoski (1991) follows:

> A construct [is] a concept that has been deliberately created or adopted for a scientific purpose.
>
> The term predictor construct [means] some aspect of a person which . . . has relevance to predicting future behavior or performance. While the phrase implies an attribute of a device or measure, it usually . . . [references] a factor [to distinguish] among individuals. (p.4)

In addition, the literature suggests that the ideal number of constructs for an instrument should be between 10 and 20. Accordingly, the original list of 75 constructs was rationally reviewed and reduced to 16. A lengthy process of combining closely related constructs, rewriting and condensing definitions, renaming certain constructs, deleting and adding others resulted in the list of 10 shown in Table 4.

Insert Table 4 about here

Due to the overlap of constructs identified in the June 28, 1991, report of the Secretary's Commission On Achieving Necessary Skills (SCANS) (USDOL, 1991), attempts were made to include as many of the Competencies listed in that report.

After rationally selecting the constructs, definitions were written. A standard format was used for each definition, modifying the model used by Peterson et al. (1990). The model used has three sentences: The first defines the construct; the second describes the attributes of a person who scores high on the trait; and the third describes the attributes of a

person who scores low on the trait.

Employer Contacts

Employers will be selected for data collection based on (a) availability of occupation being researched, (b) size, and (c) location. A database of potential employers will be maintained. If selected employers meet the design requirements and agree to participate in the study, cooperation will be solicited for: (a) job analysis, (b) instrument administration, and (c) criterion collection. The goal is for the employer to participate in all three phases.

Job Analysis

Concurrently with construct development, selecting a job analysis method and developing a job analysis instrument to verify the constructs was undertaken. Seven methods were reviewed. (McCormick, 1979).

A task inventory measuring relative frequency and importance of tasks was chosen. A preliminary job analysis instrument was drafted by combining clerical task statements from three existing sources and adapting the scoring formats. Task statements were alphabetized, as suggested in McCormick (1979) and numbered sequentially. Two response scales were

written: Time spent doing and Importance to job. The response options were 0 through 4 for each scale.

A draft was administered to a sample of employed clericals. Subsequently, the instrument was revised to eliminate redundancies and improve readability. In addition, items were grouped according to task and behavior elements, as recommended by F.W. Erwin (personal communication, April 6, 1992). The response options were reduced to 0 through 3 for each scale because options 1 and 2 were barely distinguishable from each other. This format closely resembles that of the Job Requirements Questionnaire for Office and Related Classifications published by Richardson, Bellows, and Henry Company (1985).

A preliminary analysis to identify patterns of responses and verify construct selection has been undertaken, but not yet completed.

Item Writing

In January, 1992, six analysts from the NTDFC and six analysts from the other TDFCs and the national office attended a three day seminar in background data and item writing. The seminar was conducted by Dr. Michael Mumford and his staff at George Mason

University, in Fairfax, Virginia.

Item writing began following the seminar. A six member biodata team from the NTDFC has been meeting regularly since then to generate construct-related items. Each item describes life experiences that parallel the behavior or job tasks described within the construct definition.

Items are written using one of the seven formats (Mumford, 1992) shown in Table 5.

Insert Table 5 about here

The items are reviewed for (a) conciseness, (b) bias, (c) readability or colloquial expression, (d) pleasant and neutral connotation, (e) relevance to the construct, and (f) fakability. Items are accepted, revised, rejected, or assigned to another construct. The order of all the responses or options is checked for consistency. This is important to avoid confusing examinees and to avoid possible scoring problems.

Analysts who attended the item writing seminar from the three other TDFCs and the national office will assist in writing items. This process of writing,

screening, and rewriting will continue until over 1,000 items have been generated. The large number of items is necessary to accommodate alternate forms.

Some consideration will be given to reviewing items from existing biodata item pools. Items from other sources will be used when the relevant behavior of a construct is difficult to describe and/or lacks the 50-60 items per construct needed for the pilot instrument. Among other possible sources for item generation are: (a) Catalogue of Life History Items (Glennon, et al., 1966), (b) 2,000 Scaled Items (Uhrbrock, 1961), and (c) Development and Use of the Weighted Application Blank (England, 1971).

Over 700 items have been written. After 1,000 items have been written and revised, they will be submitted to two expert panels: a review panel, consisting of representatives from the Equal Employment Opportunity, Civil Rights and Legal Departments in the State of Michigan, and an advisory panel consisting of the experts experienced in biodata instrument development and use.

Both panels will screen the content of each item for the following five principles: (a) non-bias and

non-stereotyping, (b) job relevancy, (c) invasion of privacy, (d) events under the control of the job applicant, and (e) verifiability (Gandy, et al. 1989).

By August, 1993, the items will be revised and pilot-tested nationwide. After data collection, item analysis will determine which items are non-predictive, biased, or inappropriate.

The experimental instrument will be developed with a minimum of 30-40 items for each construct. The instrument will be administered to a national sample. After the final data analysis, the remaining items will be divided to create alternate forms of the biodata instrument. Each form will consist of 100-150 items.

Scoring

When data collection and item analysis are completed, a scoring method will be chosen. The instrument will be empirically keyed. This is the traditional approach to scoring biodata.

There are a variety of scoring methods:

1. Horizontal Per Cent: The simplest and most commonly used technique where the response is weighted proportionally to the probability of success.

2. Vertical Per Cent: This method is also

commonly used and depends on the discriminating power of the response. High and low criterion groups are designated, and weights are assigned based on response differences. The weight for any category is a function of the significance of the difference between percentages computed for both groups.

3. Reciprocal Averages: In this method, weights for an item are proportional to its correlation with the composite or to its loading on a common factor. This is done to satisfy two requirements: (a) The weight assigned to any response category is the average of the total scores of all people responding in that category and (b) each individual's total score is the average of the weights assigned to his/her responses.

4. Keying by Patterns of Response: This method groups items by content. Within each group, each item is correlated with the criterion. Phi coefficients are computed for items not rejected.

5. Differences in Percentages: This method is a modification of the vertical per cent method that is utilized with Strong's tables (England, 1971). High and low criterion groups are established and assigned net weights.

6. Rare Response: In this method weights are assigned to items based on their frequency of response in the total applicant sample.

7. Correlation Coefficients: Biserial correlation is used for relating a continuous, normally distributed variable with a dichotomous variable having an underlying normal distribution; Point Biserial correlation is used for relating a continuous, normally distributed variable with a genuine dichotomy.

8. Option-keying strategy: Each item response alternative is analyzed separately and contributes to the score only if it correlates significantly with the criterion (Kluger et al., 1991).

There are other methods of scoring not mentioned here and each scoring approach has advantages and disadvantages. According to Guion (1965), depending on the purpose of the biodata instrument, one method of scoring may be more appropriate than another. This is further confirmed by Aamodt and Pierce, Jr. (1987), who state that problems scoring items with the Rare Response method are too numerous to use for all jobs. They also mention that the method chosen to weight biodata items is important and will affect the outcome

of the validation procedures.

Once a scoring method has been selected, statistical analysis is conducted. To analyze the data, the Statistical Package for the Social Sciences (SPSS) will probably be used.

Item Bias

Differential item functioning is referred to in most of the literature as item bias or item discrepancy. Berk (1982), states that item bias studies are necessary, but may not be sufficient for all score inferences and uses. He also mentions that bias of any kind is undesirable, and every effort should be expended to minimize bias. Two principal approaches have been used to study item bias: judgmental and statistical. The two approaches serve as types of quality control in the test development process to provide subjective and/or objective information to modify or eliminate biased items. The literature places enough emphasis on item bias analysis that a careful look at this process is warranted, particularly for biodata development.

Validation

Research shows that biodata has high validity for

predicting a wide range of criterion measures. According to van Rijn (1980), biodata has proven to be one of the best predictors of future behavior. There are three validation models: (a) criterion-related validity, (b) content validity, and (c) construct validity. A combination of these measures is likely, but the optimum combination should be based on needs, purposes, and contexts for which the instrument is intended.

Reliability

Van Rijn (1992) mentions that test-retest reliability estimates are more suitable measures of biodata's reliability than other estimates based on internal consistency. Mumford and Owens (1987) also note that the combination of low item intercorrelations and high retest reliability permits the use of a few biodata questions to capture a lot of information about an applicant. In any situation, the selection of test items to increase reliability will tend to increase validity (Henrysson, 1971).

Computer Adaptation

A paper and pencil scannable form will be developed for testing groups, along with a computerized

version for self-administration. A self-administered version enables the applicant to quickly complete the questionnaire, reducing administration time, lowering costs, and increasing efficiency and flexibility. This will also simplify scoring and improve security of keys. The instrument will probably be contained on one disk(s) and/or loaded on hard disk drive.

Future Research

Research will continue on the biodata instrument for other occupational clusters. Health care occupations is being considered for the next cluster. With the experience from the first endeavor in the clerical area, instrument development for succeeding clusters should go more quickly.

Table 1

Test Development Network

National Office:

Washington, DC

Northern Area:

Michigan (Northern Test Development Field Center)

Massachusetts Test Research Unit

Illinois Test Research Unit

New Jersey Test Research Unit

New York Test Research Unit

Pennsylvania Test Research Unit

Southern Area:

North Carolina (Southern Test Development Field Center)

Alabama Test Research Unit

Arkansas Test Research Unit

South Carolina Test Research Unit

Tennessee Test Research Unit

Texas Test Research Unit

Virginia Test Research Unit

Washington, DC Test Research Unit

Western Area:

Utah (Western Test Development Field Center)

Table 1 (Continued)

Test Development Network

Arizona Test Research Unit

Colorado Test Research Unit

New Mexico Test Research Unit

Oregon Test Research Unit

California (California Test Development Field Center)

Table 2

USES Assessment Instruments

General Aptitute Test Battery (GATB)

Nonreading Aptitude Test Battery (NATB)

Bateria de Examenes de Aptitud (BEAG)

GATB For The Deaf

Basic Occupational Literacy Test (BOLT)

Wide Range Scale

Interest Checklist

Interest Inventory

Clerical Skills Proficiency Tests

- Typing test
- Statistical typing test
- Automated typing test
- Dictation test
- Spelling test
- Legal spelling test
- Medical spelling test

Table 3

Biodata Instrument Development Plan

Step 1	Research Plan	8/91
Step 2	Interview and Report on Experts Contacted	12/91
Step 3	Advisory Panel Selection	Pending
Step 4	Item Writing Training	1/92
Step 5	Job Analysis - Clerical Occupations	10/92
Step 6	Criteria Development	12/92
Step 7	Pilot Instrument Form	11/92
	A. Data Collection	
	B. Item Analysis	
Step 8	Experimental Instrument	TBA
	A. Data Collection	
	B. Data Analysis	
Step 9	Report and Manuals	TBA

Table 4

Remaining 10 Constructs After March, 1992, Revision

Communication

Follow(s) Directions

Information Processing

Interpersonal

Investigating

Motivation

Reasoning

Responsible

Teamwork

Versatility/Variety

Table 5

Item Writing Formats

From "Methodology Review: Principles, Procedures, and Findings in the Application of Background Data Measures" by M. D. Mumford and W. A. Owens, 1987, Applied Psychological Measurement, 11 (1), p. 1-31. Copyright 1987 by the Appied Psychological Measurement Inc. Reprinted by Permission.

1. **Yes-No**
   Have you found your life to date to be pleasant and satisfying?

2. **Non-continuum, single choice**
   What was your marital status at college graduation?
   a) Single
   b) Married, no children
   c) Married, one or more children
   d) Widowed
   e) Separated or divorced

3. **Continuum, single choice**
   What is your weight?
   a) Under 135 pounds
   b) 136 to 155 pounds
   c) 156 to 175 pounds
   d) 176 to 195 pounds
   e) Over 195 pounds

4. **Non-continuum, multiple choice**
   Check each of the following from which you have suffered.
   a) Allergies
   b) Asthma
   c) Ulcers
   d) Epilepsy
   e) Headaches
   f) Arthritis
   g) Gastrointestinal upsets
   h) High blood pressure
   i) Loss of hearing

5. **Non-continuum, plus escape option**
   When are you most likely to have a headache?
   a) When I strain my eyes
   b) When I don't eat on schedule
   c) When I am under pressure
   d) January first
   e) Never have headaches

6. **Continuum, plus escape option**
   What was your length of service in your most recent job?
   a) Less than 6 months
   b) Between 6 months and 1 year
   c) 1 to 2 years
   d) 2 years or more
   e) No previous full time job

7. **Common stem, multiple continuum**
   Over the past 5 years, how much have you enjoyed the following? (use 1 to 4 below)
   a) Loafing or watching TV
   b) Reading
   c) Constructive hobbies
   d) Home improvement
   e) Outdoor recreation
      1) Very much
      2) Some
      3) Very little
      4) Not at all

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